August 2, 2002, which is a reissue of U.S. Patent No. 5,704,720, which corresponds to U.S. Patent Application No. 08/553,584 filed February 26, 1996, which is the U.S. national stage of International Application No. PCT/JP95/00467, filed March 17, 1995.--

IN THE CLAIMS:

Please cancel original patent claims 6, 7, 11, 12, 16 and 17 without prejudice to or disclaimer of the subject matter contained therein.

REMARKS

Claims 1-5, 8-10, 13-15 and 18-30 are pending. By this Amendment, original patent claims 6, 7, 11, 12, 16 and 17 have been cancelled. Please note that the above-identified cancelled claims were rewritten in independent form (either by rewriting the claims in independent form or by placing their features into their corresponding independent claim) in the above-identified parent reissue application. Accordingly, the above-noted claims are cancelled so that there are no redundant claims between the present application and the parent application. Please note that claims 21-23, added in this reissue application, correspond to claims 21-23, which were added in the parent reissue application. In addition, claims 24-30 of this reissue application, correspond to claims 39-43, 46 and 47, respectively, from the parent reissue application. During prosecution of the parent reissue application, features of an objected-to claim were placed into independent claim 39. Thus, claims 24-30 of the present application are not redundant to claims 39-43, 46 and 47 of the parent reissue application.

Applicants respectfully submit that all pending claims of this reissue application are in patentable for the reasons set forth in Applicants' responses filed in the parent application.

The Information Disclosure Statement (IDS) filed herewith submits copies of all references of record from the original patent prosecution and from the prosecution of the parent reissue application, which includes a copy of JP-U-63-53922 (hereafter JP-922), along

with an English-language translation thereof. JP-922 was cited in an Opposition against the corresponding Japanese patent of U.S. Patent No. 5,704,720. A copy of a Trial Decision revoking the claims of the corresponding Japanese patent based upon JP-922 is attached hereto. Applicants respectfully submit that all claims of this reissue application are patentable over JP-922.

Examination and allowance in due course are earnestly solicited.

Respectfully submitted,

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JAO:MAC/ccs

Enclosure:
Translation of Japanese Trial Decision

Date: July 25, 2003

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Trial Decision

Trial Decision Number 35104, Year 1999

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The following is the trial decision concerning the invalidity trial with respect to the patent related to claims 1-3 of the invention "sliding bearing" of Patent Number 2795305 between the above-mentioned parties.

Conclusion

The patent of the invention related to claims 1-3 of Patent Number 2795305 is invalid.

The patentee shall bear the burden of paying the trial expenses incurred.

Reasons

I. Prosecution history

A patent application of the invention related to claims 1-3 of Patent Number 2795305 was filed on March 18, 1994, and for this invention the patent was issued on June 26, 1998.

Daido Metal Company, Ltd., which is the party requesting a judgment of invalidity, filed Article A Nos. 1-16 as exhibits on March 9, 1999, requested witness testimony and a trial judgment of invalidity of this case by pointing out insufficient descriptions in the specification, and asserted that the patent related to claims 1-3 of this case should be invalid.

The patentee replied on June 28, 1999, and filed a rebuttal on September 10, 1999.

Furthermore, Takayuki Shibayama, a witness, was examined at a trial court room at the Japanese Patent Office on March 22, 2000. Therefore, the patentee filed a Correction Request on April 21, 2000. Meanwhile, a notification of refusal of correction was issued on July 31, 2000, and Remarks were filed on October 10, 2000.

II. Appropriateness of Correction

1. Summary of the Correction Request

The Correction Request filed by the patentee on April 21, 2000 was to correct the specification (hereafter referred to as "patent specification") attached to Patent Application No. 2795305 as follows, as described in the amended specification attached to the Correction Request, in order to narrow the scope of the claims and to clarify unclear descriptions.

(1) In order to narrow the scope of the claims, in claims 1-3 of the scope of the patent claims in the patent specification, "by a boring process" is inserted after "circumferentially on a sliding contact surface ", "so that a spacing of peaks between the sliding contact surface of a

rotating shaft side and the sliding contact surface of the sliding bearing side is reduced" is inserted after "in an axial cross-section", and "the top of the peak" is changed to "the top of each peak ".

As a result, it was attempted to amend claims 1-3 which formerly read as follows:

"[Claim 1] A sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis, the top of the peak having a height ΔC above the imaginary reference line, and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by four rectilinear lines given by the following mathematical equations:

$h = \Delta C$ ··· (1)

$h = 5 / 1.9\,\Delta C$ ··· (2)

$h = 8$ ··· (3)

$\Delta C = 1$ ··· (4)

where h and ΔC are measured in units of µm.";

"[Claim 2] A sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total

cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis, the top of the peak having a height ΔC above the imaginary reference line, and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by four rectilinear lines given by the following mathematical equations:

$$h = \Delta C \qquad \cdots (1)$$

$$h = 2\,\Delta C \qquad \cdots (2)$$

$$h = 8 \qquad \cdots (3)$$

$$\Delta C = 1.5 \qquad \cdots (4)$$

where h and ΔC are measured in units of μm."; and

"[Claim 3] A sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis, the top of the peak having a height ΔC above the imaginary reference line, a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by three rectilinear lines given by the following mathematical equations:

$$h = \Delta C \qquad \cdots (1)$$

$$h = 5 \qquad \cdots (2)$$

$\Delta C = 3$ ··· (3)

where h and ΔC are measured in unit of μm.", to:

"[Claim 1] A sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface by a boring process, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis so that a spacing of peaks between the sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced, the top of each peak having a height ΔC above the imaginary reference line and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by four rectilinear lines given by the following mathematical equations:

$h = \Delta C$ ··· (1)

$h = 5 /1.9\Delta C$ ··· (2)

$h = 8$ ··· (3)

$\Delta C = 1$ ··· (4)

where h and ΔC are measured in units of μm.";

"[Claim 2] A sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface by a boring process, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak

regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis <u>so that a spacing of peaks between the sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced</u>, the top of <u>each peak</u> having a height ΔC above the imaginary reference line and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by four rectilinear lines given by the following mathematical equations:

$h = \Delta C$ ··· (1)

$h = 2\ \Delta C$ ··· (2)

$h = 8$ ··· (3)

$\Delta C = 1.5$ ··· (4)

where h and ΔC are measured in units of μm."; and

"[Claim 3] A sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface <u>by a boring process</u>, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis <u>so that a spacing of peaks between the sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced</u>, the top of <u>each peak</u> having a height ΔC above the imaginary reference line and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical

representation, the parameters ΔC and h being located within an area defined by three rectilinear lines given by the following mathematical equations:

$$h = \Delta C \quad \cdots (1)$$

$$h = 5 \quad \cdots (2)$$

$$\Delta C = 3 \quad \cdots (3)$$

where h and ΔC are measured in units of μm."

(2) In section [0004] of the patent specification,

"[Means of Solving the Problem]

In view of the foregoing, the invention provides a sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend in circumferentially on a sliding contact surface, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis, the top of the peak having a height ΔC above the imaginary reference line, ..." is changed to

"[Means of the Solving the Problem]

In view of the foregoing, the invention provides a sliding bearing in which a plurality of annular continuous or discontinuous peaks are formed which extend circumferentially on a sliding contact surface, <u>by a boring process</u>, and an imaginary reference line is defined which intersects with each peak region at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis <u>so that a spacing of peaks between the</u>

sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced, the top of each peak having a height ΔC above the imaginary reference line. . . " in order to make the description of the scope of the claims uniform with the description of the Detailed Description of the Invention, with the object of clarifying unclear descriptions.

(3) In section [0006] of the patent specification, in order to clarify the unclear description of

".... and a height ΔC, as measured from the imaginary reference line L to the top 1a' of each peak 1a, is chosen to be in a range from 1 to less than 8 μm. . ." is changed to

".... and, a height ΔC, as measured from the imaginary reference line L to the top 1a' of each peak 1a, is chosen to be in a range between 1 and 8 μm or less. . . ".

(4) In section [0006] of the patent specification, in order to clarify the unclear description of

".... by arranging a plurality of annular grooves which extend circumferentially on a sliding contact surface, discontinuous annular peaks which extend circumferentially can also be formed." is changed to

".... by arranging a plurality of annular grooves which extend circumferentially on a sliding contact surface, discontinuous annular peaks can also be formed" [i.e., "which extend circumferentially" is deleted].

2. Appropriateness of Correction Objectives and Existence of Broadening/Changes

(1) The correction in which "by a boring process" in the correction concerning claims 1-3 of the above-mentioned 1, (1) is added was described as "the above-mentioned spiral groove 1B is formed by a boring process" in section [0006] of the patent specification (see Patent

Publication, col. 4, lines 40-41), and "annular continuous peaks" and "valley-shaped recess regions" were limited to being formed by a boring process.

Furthermore, the correction adding "so that a spacing of peaks between the sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced" was described as "even if an internal diameter dimension of the sliding contact surface of the sliding bearing is set to be smaller so that a spacing of peaks between the sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced, the actual space between the rotating shaft and the sliding bearing is larger than the case of a convention sliding bearing, so frictional resistance between the sliding contact surfaces can be reduced" in section [0006] of the patent specification (see Patent Publication, col. 4, lines 17-22). This change limits the internal diameter dimension of the sliding contact surface of the sliding bearing to being set small so that a spacing of peaks between the sliding contact surface of a rotating shaft side and the sliding contact surface of the sliding bearing side is reduced.

Additionally, with respect to the correction of "the top of the peak" to "the top of each peak", "a plurality of annular continuous or discontinuous peaks which extend circumferentially on a sliding contact surface" and "which intersects with each peak region" were described in claim 1 before it was amended. Not only the top of each peak having a height ΔC above the imaginary reference line but also the height of all the tops of the peaks needs to be clarified, so this corresponds to a correction of the specification in order to clarify unclear descriptions.

(2) The correction concerning [Means of Solving the Problem] of section [0004] of the patent specification of the above-mentioned 1, (2) is to create uniformity between the description of the Scope of the Claims and the description of the Detailed Description of the

Invention which became necessary along with the correction of claims 1-3, so this corresponds to a correction of the specification in order to clarify an unclear description.

(3) The correction of "to less than 8 μm" to "8 μm or less" in section [0006] of the patent specification of the above-mentioned in 1, (3) corresponds to a correction of the specification in order to clarify an unclear description because the description of "less than 8 μm" does not match the description of the Scope of the Claims and the description of section [0006] in view of the recitation of "$h = 8$" of equation (3) of claims 1 and 2 of the Scope of the Claims, and the recitation of "height $h \leq 8$ μm" in section [0006].

(4) With respect to the correction deleting "in a circumferential direction" of [0006] of the patent specification of the above-mentioned 1, (4), the description of "by arranging a plurality of annular grooves which extend circumferentially on a sliding contact surface, discontinuous annular peaks which extend circumferentially can also be formed" of section [0006] of the patent specification (See Patent Publication col. 7, lines 4-6) was unclear because it resulted in the statement, . . .by arranging . . . continuous . . . grooves, discontinuous . . . peaks are formed. . .".

However, according to the directly preceding description of "furthermore, in the above-mentioned two embodiments, peaks 1a are continuous in a spiral shape by spiral grooves 1B which continue in a circumferential direction of a sliding contact surface 1A, but instead of this type of spiral grooves, for each predetermined interval in an axial direction," it is recognized that the description was attempting to show that "by arranging a plurality of annular grooves which continue circumferentially in a sliding contact surface, discontinuous annular peaks can be formed."

Therefore, this correction corresponds to a correction of the specification in order to clarify an unclear description.

(5) Therefore, the corrections of this case related to the above-mentioned 1, (1)-1, (4) are, as allowed in Section 134, Article 2 of Japanese Patent Law before the 1994 proviso, and amendments within a range as described in the patent specification, but not to broaden or change the scope of the claims; therefore, these are within the requirements of the Japanese Patent Law, Section 126, Article 1 revision and Article 2 before 1994 revision applied in the same section, Article 5.

3. Determination of Independent Patentability Requirements

(1) Concerning amended invention 1

A. Amended invention 1

It is recognized that the invention of claim 1 related to the correction request (hereafter referred to as "amended invention 1") is as described in claim 1 of the Scope of the Claims of the amended specification attached to the Correction Request (see the above-mentioned 1, (1)).

B. Invention described in Article A, Number 3

Meanwhile, the Scope of the Claims of page 1 of the microfilm of Japanese Utility Model Patent Application 61-149345 (Japanese Laid-Open Utility Model Patent Application 63-53922) cited in the notification of refusal of correction (Article A No. 3 filed by the party requesting invalidity judgment. Hereafter referred to as "Article A No. 3") recites:

"A half arc-shaped bearing metal, having a sliding surface inside, in which scratches are formed in the sliding surface along a circumferential direction."

Furthermore, the Problem to be Resolved by the Invention of line 3, page 2 - line 8, page 3 describes,

"In order to reduce vibration and noise of an internal combustion engine, rigidity of a crankshaft is made high by increasing its axial diameter, and oil clearance formed on a sliding surface of a bearing metal is reduced. In addition, with respect to bearing metals used as a pair, in the bearing metal on which a load is received, a lubricant groove is not arranged, and a surface pressure is reduced by substantially broadening a width of the sliding surface. However, as is clear from the following given relationship equation, regardless of which countermeasures are taken against vibration and noise, there is a problem that frictional damage increases which negatively affects output or fuel consumption of the engine.

$$T = k\, n\, R\, 3\, L\, N / C$$

T : Frictional loss

R : Shaft radius

L: Sliding surface width

k: Constant

n : Number of bearings

N : Number of rotations

C : Oil clearance

Therefore, the problem to be resolved by the invention is to reduce vibration and noise by reducing frictional loss as much as possible by performing a process that hold lubricating oil on the sliding surface, without reducing the area that generates oil film pressure in the bearing metal."

Furthermore, as a first embodiment, with respect to bearing metals 4 and 5 used as a pair in which a sliding surface is formed of aluminum alloy 11, page 4, lines 10-19 describes that "a plurality of scratches 12 which extend circumferentially are arranged "in the surface of the

aluminum alloy 11 by a boring process. These scratches 12 have round R-shaped bottom parts [sic. "round bottoms of radius R"] and are regularly aligned over the width L of the bearing metals 4 and 5. Here, the width 1 of the scratches 12 is determined to be approximately 0.15 mm - 0.30 mm, and the depth d of the scratches 12 is determined to be approximately 0.003 mm - 0.006 mm. However, a width 1 of 0.1 mm - 0.7 mm and depth d of 0.003 mm - 0.015 mm can also be applied."

Furthermore, page 4, line 19 - page 5, line 2 of Article A No. 3 describes that "Thus, lubricating oil supplied to the bearing metals 4 and 5 does not easily leaked into the direction of the width L and can be easily held in the scratches 12, and a lubricating oil film is formed on the aluminum alloy 11 which forms the sliding surface."

Furthermore, it can be observed that Fig. 1 shows a cross-sectional view of the bearing in which "the scratches 12 have round R-shaped bottom parts [sic.] and are regularly aligned over the width L of the bearing metals 4 and 5," according to the first embodiment.

Therefore, it is recognized that Article A No. 3 describes an invention with a structural element of "a sliding bearing in which a plurality of scratches 12 which extend in a circumferential direction of a sliding surface are formed in an axial direction by a boring process" in order to "reduce vibration and noise by reducing frictional loss" by "performing a process that holds lubricating oil on a sliding surface without reducing an area that generates oil film pressure in a bearing metal."

C. Comparison and Determination

Therefore, if the amended invention 1 is compared to the invention described in Article A No. 3, "sliding surface" of the invention described in Article A No. 3 is equivalent to "sliding contact surface" of the invention related to amended claim 1. In the same manner, "scratches 12"

form valley-shaped recess regions and peaks as is clear from Fig. 1 of Article No. 3, and, because there are peaks and are equivalent to "annular discontinuous peaks" (the invention described in Article A No. 3 is a half arc-shaped bearing metal, so it is naturally recognized that the scratches 12 are discontinuous); therefore, both are "a sliding bearing in which a plurality of annular discontinuous peaks which extend in a circumferential direction of a sliding contact surface are formed by a boring process".

a. The corrected invention 1 has "the spacing of peaks between the sliding contact surface of the rotating shaft side and the sliding contact surface of the sliding bearing side is reduced." Meanwhile, Article A No. 3 does not describe a structure which is equivalent to this [invention 1] (Hereafter referred to as "difference a").

b. The amended invention 1 provides a description in which

"a sliding bearing in which an imaginary reference line is defined which intersects with each peak regions at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recessed regions, and extends parallel to the axis, the top of the peak having a height ΔC above the imaginary reference line, and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by four rectilinear lines given by the following mathematical equations:

$h = \Delta C$ ··· (1)

$h = 5 / 1.9\ \Delta C$ ··· (2)

$h = 8$ ··· (3)

$\Delta C = 1$ ··· (4)

where h and ΔC are measured in units of μm." Meanwhile, Article A No. 3 doe not directly describe a structure equivalent to this (hereafter referred to as "difference b").

These differences are considered below.

c. Concerning difference a

The structure related to the difference a of the amended invention 1 is a spacing relationship between the sliding bearing of the amended invention 1, and the shaft which is supported thereby. An appropriate spacing being provided from a viewpoint of frictional loss and lower vibration and noise is a design matter which is determined by the finishing dimensional accuracy or the like of a rotational shaft and a bearing.

Furthermore, as described above, Article A No. 3 describes that "lubricating oil supplied to the bearing metals 4 and 5 does not easily leak in a direction of the width L and can be easily held in the scratches 12, and a lubricating oil film is formed on the aluminum alloy 11 which forms a sliding surface." This shows that the spacing is reduced to a degree where lubricating oil does not easily leak from peaks of the sliding contact surface of the sliding bearing side and the sliding contact surface of the rotating shaft side. Therefore, based on this description, there is no particular difficulty in merely "reducing the spacing" to the most appropriate spacing relationship upon considering vibration and noise reduction and frictional loss.

Therefore, the difference a of "so that the spacing of the peaks between the sliding contact surface of the rotating shaft and the sliding contact surface of the sliding bearing side is

reduced" is no more than that which would have been obvious to one of ordinary skill in the art from the invention described in Article A No. 3.

d. Concerning the difference b

The depth d of the scratches 12 described in Article A No. 3 is equivalent to the height h between the top of the peak and the bottom of the valley-shaped recess portion of the amended invention 1 as is clear from Article A No. 3, description that "In the surface of the aluminum alloy 11, a plurality of scratches 12 which extend in a circumferential direction are formed by a boring process. These scratches 12 have round R-shaped bottom parts and are regularly aligned over the width L of the bearing metals 4 and 5. Here, the width 1 of the scratches 12 is determined to be approximately 0.15 mm-0.30 mm, and the depth d of the scratches 12 is determined to be approximately 0.003 mm-0.006 mm" in addition to the description of Fig. 1 showing the depth d.

Furthermore, according to the description of Fig. 1 and the description of "these scratches 12 have round R-shaped bottom parts and are regularly aligned over the width L of the bearing metals 4 and 5" of Article A No. 3, it is recognized that the scratches 12 are described in relation to a technical concept in which the scratches 12 are processed as an arc with radius R, width 1, and depth d, and no reason can be found it is not such a shape.

Furthermore, if ΔC (the definition which is the same as the amended invention 1) in Article A No. 3 is calculated in the case of $d = 5$ μm and $l = 0.2$ mm, which is the same case as $h = 5$ μm and $p = 0.2$ mm (p is a pitch between peaks, and is equivalent to the width 1 in Article A No. 3) as in the embodiment of the amended invention 1, the result is 3.3350 μm (see attached sheet 1 filed by the party requesting an invalidity judgment, at the time of the motion for

judgment. Furthermore, there is no dispute between the parties concerning the equations described in attached sheet 1 and the calculation result.)

Furthermore, this value is a value within a range defined by the four rectilinear lines described by the four equations (1)-(4) related to the amended invention 1.

Therefore, the difference b is no more than providing the concept of ΔC and determining a range covering the invention described in Article A No. 3; therefore, this is merely a literal difference and not a distinct difference.

e. Thus, with respect to the above-mentioned difference a, the amended invention 1 would have been obvious from the invention described in Article A No. 3, and the difference b is merely a literal difference and is described in Article A No. 3. Therefore, the amended invention 1 would have been obvious to a person of ordinary skill in the art based on the invention described in Article A No. 3.

(2) Concerning amended inventions 2 and 3

A. Amended inventions 2 and 3

a. It is recognized that the invention of claims 2 and 3 related to the Correction Request (hereafter referred to as "amended invention 2" and "amended invention 3", respectively) are described in claims 2 and 3 of the Scope of the Claims of the amended specification attached to the Correction Request (see the above-mentioned 1, (1)).

Furthermore, the only difference from the amended invention 1 is that, with ΔC taken on the vertical axis and h taken on the horizontal axis in a graphical representation, the ΔC and h are located within an area defined by four rectilinear lines given by equations (1)-(4) or (1)-(3) described in claims 2 and 3 related to the respective corrections.

Therefore, in the case of $h = 4.5$ μm and $p = 0.2$ mm, $\Delta C = 3.0012$ μm (see attached sheet 1, submitted by the party filing the request for judgment of invalidity is established; therefore, this is located within an area defined by four rectilinear lines given by the above-mentioned four or three equations.

b. Therefore, due to the same reason as described in the above-mentioned "(1) Concerning amended invention 1", based on the invention described in Article A No. 3, the invention related to amended inventions 2 and 3 would have been obvious to a person of ordinary skill in the art.

4. Conclusion as to whether corrections are appropriate

Therefore, none of the amended inventions 1, 2 and 3 are recognized as independently patentable when the patent application was filed; therefore, this does not meet the requirements of the Japanese Patent Law, Section 126, Article 3, applied in Japanese Patent Law, Section 134, Article 5 before the 1994 revision.

Thus, the corrections related to the Correction Request of this case cannot be granted.

In the Remarks dated October 10, 2000 in response to the notification of refusal of correction, the party requesting correction asserted that Article A No. 3 does not describe anything about peaks being aligned, and that the peaks are not aligned because the peaks are not actually aligned in a boring process, and that serious consideration is needed in order to align peaks. The party requesting correction explains how to reduce rotation irregularity of a spindle during the manufacturing of the invention of this case.

Furthermore, [the party requesting correction] asserts that the bearing surface of Article A No. 3 is undulated in a width direction, and that the peaks overall are not aligned.

However, the invention described in Article A No. 3 solves a technical problem "of reducing vibration and noise by reducing frictional loss" by "performing a process that holds lubricating oil on a sliding surface without reducing an area that generates oil film pressure in a bearing metal," and not only improves processing accuracy of a conventional sliding surface in order to smooth [the sliding surface] but also holds the lubricating oil thereon by intentionally arranging scratches. This is clear from the description of "a technical problem of this invention is to reduce vibration and noise by reducing frictional loss by performing a process that holds lubricating oil on a sliding surface without reducing an area that generates oil film pressure in a bearing metal" in lines 4-8, page 3 and the description of Fig. 1.

Furthermore, in Article A No. 3, according to the description (page 3, lines 16-19) stating that a depth d of 0.003-0.006 mm is good and the description (page 3, line 19 - page 4, line 1) stating that lubricating oil supplied to the bearing metals 4 and 5 can be easily held in the scratches 12 and does not easily leak in the direction of the width L, it is recognized that accuracy is planned to a degree where scratches with a depth of 3-6 μm on the bearing described in Article A No. 3 hold oil, and that the oil does not easily leak in the width direction. To a person of ordinary skill in the art, with respect to processing accuracy of the scratches 12, it is clear that accuracy is required to a degree where scratches with 3-6 μm depth can be distinguished as having a shape as shown in Fig. 1.

Additionally, normally, according to the description (page 4, lines 13-14) that the scratches 12 are regularly aligned over the width L of the bearing metals 4 and 5 and there is a bearing holding a straight shaft, it is natural to interpret that there is no so-called undulation in the scratches 12 described in Article A No. 3, and that the bearing surfaces have continuous

peaks at the same height aligned over the entire width L. This is the only technically viable interpretation of the bearing surfaces.

Therefore, there is no sufficient evidence that the peaks are not aligned, or that they undulate in the bearing surface described in Article A No. 3, as asserted by the party filing the Correction Request.

Furthermore, regarding the assertion by the Remarks that an object of the amended inventions 1-3 of this case is to align peaks, and that, in order to accomplish this object, "serious consideration" is needed, this "serious consideration" is not described in the patent specification, and thus cannot be recognized as an assertion that is based on the description of the patent specification.

III. Invention of this Case

The amendment related to the correction request dated April 21, 2000 filed by the party filing the opposition cannot be granted due to the reasons set forth above in Section II, so the invention of this case is recognized as described in claims 1-3 described in the patent specification (see the above-mentioned II, 1, (1). Hereafter referred to as "invention 1 of this case", "invention 2 of this case", and "invention 3 of this case" related to claims 1, 2, and 3, respectively.)

IV. Assertion by the Party Filing the Opposition

1. The party filing the opposition asserts the following statement in this request for judgment of invalidity.

(1) The invention 1 of this case is an invention described in Article A Nos. 3, 4, 7, 8, and 12-16. The invention 2 of this case is an invention described in Article A Nos. 3, 15, and 16. The invention 3 of this case is an invention described in Article A No. 3. Therefore, patentability

cannot be granted under Japanese Patent Law, Section 29, Article 1 (hereafter referred to as "invalidity reason 1").

(2) The invention 2 of this case would have been obvious to a person of ordinary skill in the art based on the invention described in Article A No. 7, and a known invention as described in Article A Nos. 2, 6, and 10. The invention 3 of this case would have been obvious to a person of ordinary skill in the art based on the invention described in Article A No. 7 or the invention described in Article A Nos. 12-16, and a known invention described in Article A Nos. 2, 6, and 10. Therefore, patentability cannot be granted under Japanese Patent Law, Section 29, Article 2 (hereafter referred to as "invalidity reason 2").

(3) The patent specification has insufficient descriptions, so this patent application as filed does not satisfy the requirements under Japanese Patent Law, Section 36, Article 4 (hereafter referred to as "invalidity reason 3").

V. Assertion by the Patentee

1. The patentee provides the following counterarguments.

(1) Concerning invalidity reasons 1 and 2

[Concerning the invention 1 of this case]

A. As Article B No. 1,1, a measurement result diagram of a surface of a sliding bearing of the invention of this case, related to manufacturing by the patentee, was filed. As Article B No. 2,1, a measurement result diagram of a surface of a sliding bearing (a sliding bearing related to manufacturing by NDC Corporation, which is not part of this suit) sold in the market was filed. According to the measurement results, the peaks are aligned in the surface of the sliding bearing related to the invention of this case. Meanwhile, the peaks are not aligned in the surface

of the sliding bearing sold in the market, and it is not intended that peaks and valley-shaped recess regions of the same shape be aligned.

B. Peaks are not aligned in the measurement result diagram of the surface of the sliding bearing of Article A No. 12, and it not clear whether the valley-shaped recess regions and peaks are continuous in a circumferential direction.

Furthermore, in Article A No. 12, a finishing symbol is ∇ ∇ ∇, and the 10-point average surface roughness defined by JIS [Japanese Industrial Standards] is small. However, the height h of the peaks in the invention of this case cannot be compared with the height of the peaks defined by the 10-point average surface roughness where peak height is random.

C. The sliding bearing of Article A Nos. 15 and 16 is not different from the one of the above-mentioned Article A No. 12.

D. The party filing the opposition merely asserts that the party filing the opposition sold the sliding bearing of Article A Nos. 13 and 14, and this cannot be recognized as prior art disclosed before the application of this case was filed.

E. In Article A No. 3, scratches which extend in a circumferential direction are formed by a boring process and lubricating oil is saved thereon. This point is the same as in the invention of this case. However, it is not disclosed that the cross-sectional shapes of the scratches are made to be the same in the circumferential direction, and the relationship between the peak height h and ΔC is not indicated or explained.

With respect to the relationship between the peak height h and ΔC, the party filing the opposition asserts that Article A No. 3 is within the range of the invention of this case; however, this relationship only becomes significant once the cross-sectional shapes of the valley-shaped recess regions and peaks are aligned in circumferential and axial directions. Therefore, even if

the peak height which is schematically described seems to be aligned in Fig. 1, this is not a meaningful assertion because there is no description of alignment of the peak height and formation.

Furthermore, in Article A No. 3, there is a description that the scratches have a depth d of 3-15 μm; however, this should be interpreted as an average depth, and does not show that the cross-sectional shapes are the same.

F. Article A No. 4 merely describes that a roughness of 3 μm is obtained by a boring process.

G. Article A No. 7 describes that the surface roughness is 5-10 μ**[m]**; however, there is no description of alignment of cross-sectional shapes of valley-shaped recess regions and peaks adjacent to each other.

H. In Article A No. 8, Fig. 2 discloses groove shapes with a depth of 2.5 μm by a boring process, as a mathematical model.

However, this is a shape as a model for a theoretical analysis with respect to a tool mark, and it cannot be interpreted that a sliding bearing as shown in Fig. 2 actually exists. The relationship between the peak height h and ΔC and the arrangement of peaks and valley-shaped recess regions in the bearing surface are not described as a technical concept.

[Concerning the invention 2 of this case]

The invention 2 of this case is not the same as the invention described in Article A Nos. 3, 15, and 16 due to the same reason as the reason for the invention 1 of this case described above. Furthermore, Article A No. 7 does not describe that the cross-sectional shapes of the peaks and the valley-shaped recess regions adjacent to each other are aligned. Therefore, [the

invention 2 of this case] would not have been obvious from the invention described in Article A No. 7 and the invention described in Article A Nos. 2, 6, and 10.

[Concerning the invention 3 of this case]

The invention 3 of this case is not the same as the invention described in Article A No. 3 due to the same reason as for the invention 1 of this case described above. Furthermore, Article A No. 7 does not describe that the cross-sectional shapes of the peaks and the valley-shaped recess regions adjacent to each other are aligned; therefore, [the invention 3 of this case] would not have been obvious from the invention described in Article A No. 7 and the invention described in Article A Nos. 2, 6, and 10.

(2) Concerning the invalidity reason 3

With respect to the description of the Detailed Description of the Invention of the specification, it is unreasonable for the party filing the opposition to assert description insufficiency by saying that "the experimental data has to prove that effects of the invention of this patent [application] must exceed known expectations, but such a comparison with known technology is not described".

The invention of this case has a characteristic of novelty in the structure described in the scope of the claims, and patentability should be recognized if such a structure provides progressivity with respect to prior art technology.

That is, patentability was not obtained by proving that the experimental data of the specification exceeds expectations of prior art technology.

Additionally, with respect to the description of claims, the party filing the opposition asserts that evidence showing that the range restricted by numerical values is essential to the

structure of the invention is not clear; however, an applicant can arbitrarily set the range in each claim, so it cannot be said that the description is insufficient due to this reason.

2. Other Assertions by Patentee

The patentee asserted the following in oral hearings on September 27, 1999 and March 22, 2000 and, in the written report dated October 18, 1999.

(1) In the invention of this case, with respect to the evidence showing that the peak heights are aligned in a circumferential direction and an axial direction,

[Evidence 1]

Fig. 3 discloses examples of a value of $\Delta C = 2.5$ μm and a value of $\Delta C = 3.5$ μm.

ΔC is appropriately determined within a range of 1-8 μm in the invention related to claim 1; however, if a predetermined value is not constant, in Fig. 3, the value of $\Delta C = 2.5$ μm cannot be distinguished from the value of $\Delta C = 3.5$ μm, and even if they can be distinguished from each other, they will be meaningless.

Therefore, the peak height is aligned at least to a degree where $\Delta C = 2.5$ μm can be distinguished from $\Delta C = 3.5$ μm.

[Evidence 2]

The specification describes that ΔC is between 1 μm and 8 μm.

[Evidence 3]

In the specification, the spacing between the sliding contact surface of the rotating shaft and the surface of the sliding bearing is described as "the dimension between the top 1a' of the peak 1a and the sliding contact surface 2A of the rotating shaft 2," and this description presents a presumption that the dimension is constant.

[Evidence 4]

It is described that impact noise can be reduced.

[Evidence 5]

Figs. 1 and 7 show that peak heights are aligned.

(2) Concerning the shape of the tops of the peaks

It is understood that the tops of the peaks can be sharpened or slightly rounded.

(3) Concerning the technical meaning of "clearance is reduced"

In the invention of this case, the peak heights are aligned. Meanwhile, in the prior art reference, the peak heights of the sliding bearing are not aligned.

Therefore, in a conventional sliding bearing, a spacing between a sliding contact surface of a rotational shaft and a surface of a sliding bearing is restricted by the highest peak. As a result, the clearance cannot be reduced.

Meanwhile, in this invention, the peak heights are aligned, so clearance can be reduced without having any high peaks.

(4) Concerning impact sound reduction effect

In the invention of this case, by reducing the clearance, impact sound is reduced.

Meanwhile, in the invention of Article A No. 3, lubricating oil supplied to the bearing metals 4 and 5 does not easily leak in a direction of the width L, and is easily held in the scratches 12. Furthermore, a lubricating oil film is formed on the aluminum alloy 11 which forms a sliding surface, so frictional loss can be reduced, and low vibration and sound can be achieved by reducing vibration.

This is an effect which is generated in comparison with a conventional sliding bearing, and is not an effect which is generated by reducing the clearance as described in the invention of this case.

(5) Concerning the content described in Article A No. 3

Article A No. 3 does not describe that the peak heights are aligned or that the clearance is reduced.

This is not obtained by a normal boring process. The peak heights can be aligned only when the peak heights are intentionally aligned.

Article A No. 3 describes that "these scratches 12 have round R-shaped [sic.] bottom parts and are regularly aligned over the width L of the bearing metals 4 and 5," and only shows the shape of the bottom parts and that the bottom parts are regularly aligned, but does not describe that the peak heights are aligned.

Thus, alignment of the peak heights cannot be easily reached by the description of Article A No. 3.

Additionally, the sliding bearing of the Article A No. 3 cannot reduce clearance because the peak heights are not aligned, and if clearance were reduced, there would be a risk of glazing [burning] due to the high peaks.

VI. Determination of this trial

(1) Determination concerning the invalidity reason 3

The party filing the opposition asserts that the patent application filed did not satisfy requirements under Japanese Patent Law, Section 36, Article 4 because the patent application is insufficiently written. Therefore, this is first considered.

With the respect to description of the Detailed Description of the Invention of the specification, the party filing the opposition asserts that "the experimental data has to prove that the effects of the invention of this patent application exceeds known expectations, but no

comparison between [this case and] the prior art technology is disclosed," and that therefore, the description is insufficient.

However, Japanese Patent Law, Section 36, Article 4 states that "in the Detailed Description of the Invention, the object, structure, and effects of the invention must be described to a degree in which one of ordinary skill in the art can easily reduce to practice." This is a rule separate from the question of whether experimental data shows that the effects of a patented invention exceed a known expectation of the prior art. No reason can be found to support the proposition that, by not proving that the effects of the invention exceed a known expectation, the experimental data explained in the Detailed Description of the Invention of the specification is unclear, or that the effects shown by the experimental data is unclear.

Additionally, with respect to the description of claims, the party filing the opposition asserts that the evidence does not make it clear that the range restricted by numerical values is essential to the structure of the invention.

However, claims can be described within a range described in the specification or drawings by an applicant; therefore, it cannot be stated that the description of claims is insufficient because the evidence does not make it clear that the range restricted by the numerical values is essential to the structure of the invention. It is not recognized that the range restricted by numerical values is unclear.

Therefore, it cannot be said that this patent application as filed does not satisfy the requirements under Japanese Patent Law, Section 36, Article 4 because the description of the specification is insufficient.

2. Determination concerning the invalidity reason 1

(1) Concerning the invention 1 of this case

A. The party filing the opposition asserts that the invention 1 of this case is an invention described in Article A Nos. 3, 4, 7, 8 and 12-16.

B. Invention described in Article A

The following invention is described in Article A Nos. 3, 4, 7, 8 and 12-16 submitted in the invalidity reason 1.

[Article A No. 3] [Japanese Utility Model Application 61-149345 (Microfilm of Japanese Laid-Open Utility Model Application 63-53922)]

Article A No. 3 describes the items described in [Invention described in Article A No. 3] of the above-mentioned II, 3, (1), B.

[Article A No. 4] (Internal combustion engine, Vol. 6, No. 56 "Design of Flat Bearing", page 47, published in February 1967)

The section of "6.4 Surface Finishing" of page 47, right column describes "bearing surface: 1.5 S (broach) - 3 S (boring, plating)".

However, even if other descriptions are referenced, it is unclear what the units are, or what symbol S means.

[Article A No. 7] ("Automobile Engineer's Handbook" pages 7-19, published by Automobile Technology Association, September 15, 1962)

The section "d. Shaft Rigidness and Surface Roughness" of pages 7-19 describes "the degree of irregularity of the bearing surface is usually 5-10 μ[m], [the degree] is 2-3 μ[m] for high speed high pressure, and [the degree] is 1 μ[m] or less at super high speed".

[Article A No. 8] (JOURNAL OF MECHANICAL ENGINEERING SCIENCE, VOL. 14, NO. 3 "EFFECT OF TRANSVERSE AND LONGITUDINAL SURFACE WAVINESS ON THE OPERATION OF JOURNAL BEARINGS", page 169, published in July 1972).

The translation of Article A No. 8 describes that, with respect to the processed surface created by aero boring, oscillation of peaks and valley-shape recess regions is on the order of 0.0001 inch, and the pitch is on the order of 0.004 inch. In a mathematical model, part of the processed surface becomes a waveform which is approximated by a sine curve.

Concerning [Article A Nos. 12-16]

Article A Nos. 12-16 are shown as follows, and the party filing the opposition asserts that [Article A Nos. 12-16] describe all bearing metals related to manufacturing by the party filing the opposition, and that the products are well known and reduced to practice.

[Article A No. 12] October 1986, photograph(s) of a bearing metal supplied to Yanma Diesel Kabushiki Kaisha manufactured by Daido Metal Company, Ltd., manufacturing drawings, product measurement data (test data), test certificate, and purchase certificate of Yanma Diesel Kabushiki Kaisha.

[Article A No. 13] October 1980, photograph(s) of a bearing metal supplied to Ishikawa Harima Heavy Industries Kabushiki Kaisha manufactured by Daido Metal Company, Ltd., manufacturing drawings, product measurement data (test data), and height reference chart by master gage.

[Article A No. 14] October 1989, photograph(s) of a bearing metal supplied to Kanko Zoki Kabushiki Kaisha manufactured by Daido Metal Company, Ltd., manufacturing drawings, product measurement data (test data), and test certificate.

[Article A No. 15] June 1969, photograph(s) of a bearing metal supplied to Mitsubishi Heavy Industries Kobe Dockyard manufactured by Daido Metal Company, Ltd., manufacturing drawings, product measurement data (test data), test certificate, and purchase certificate of Mitsubishi Heavy Industries Kobe Dockyard.

[Article A No. 16] May 1965, photograph(s) of a bearing metal supplied to Kabushiki Kaisha Kubota manufactured by Daido Metal Company, Ltd., manufacturing drawings, product measurement data (test data), test certificate, and purchase certificate of Kabushiki Kaisha Kubota.

[Invention related to Article A Nos. 12-16]

According to the photographs and manufacturing drawings, these are clearly sliding bearings, and the surfaces (sliding bearing surfaces) are indicated to be processed to finishing accuracy, as shown by ∇ ∇ ∇ with respect to the surface processing.

Additionally, according to the tested data which tested roughness of the surface of an actual product, the maximum heights shown by Rmax (see Article A No. 11 for the definition of the JIS specifications which will be mentioned later) are approximately 4 μm, 7 μm, 4 μm, 6 μm, and 7 μm, respectively, in order with respect to Article A Nos. 12-16.

Furthermore, according to the diagrams of the tested data, the cross-sectional shape of the bearing surface has a complex waveform which also seems as if there were periodicity.

Therefore, it is recognized that Article A Nos. 12-16 describe "a sliding bearing which is designed to meet demands such that a surface which requires a generally high degree of flatness is finished with accuracy to a degree which is indicated to be processed as ∇ ∇ ∇, and in which the maximum height Rmax is actually approximately 4-7 μm, and although it is unclear whether the cross-sectional shape is intentionally designed or unavoidably generated by a so-called "tool mark" due to the boring process, this is a sliding bearing which forms a complex waveform which also seems as if there were periodicity."

Thus, it is recognized that the bearing related to Article A Nos. 15 and 16 was well known before filing of this patent application according to the testimony of the witness.

Furthermore, it is not established that the bearing related to Article A Nos. 12-14 was well known before the filing of this patent application; however, the following comparison and determination is performed as if this were well known before filing of this patent application.

C. Comparison and determination for invention 1 of this case

a. Concerning assertion of a patentee with respect to the height of peaks of a bearing surface

On performing the comparison and determination, if the fact that the heights of the peaks are aligned, which is a premise of the assertion (see [evidence 1] through [evidence 5] of V. 2 (1)), is considered, alignment of the heights of the peaks is not directly described in the patent specification. However, if even part of a cross-sectional shape of a surface of a sliding bearing is described as shown in Figs. 1 and 7, the heights of the peaks will be aligned as technical common sense, and there is no reason to interpret that the heights of the peaks are not aligned, or undulated, unless there is a particular reason.

Furthermore, lubricating oil is held between a peak and an adjacent peak, so lubricating oil cannot be held if the heights of the peaks are not aligned.

According to the above-mentioned point, it is recognized that the heights of the peaks related to inventions 1-3 of this invention are aligned.

b. Concerning the invention described in Article A Number 3 *Kokai 63-53922*

Article A Number 3 describes items described in the above-mentioned II. 3. (1). B.

If the invention 1 of this case is compared with the invention described in Article A Number 3, a "sliding surface" described in Article A Number 3 corresponds to the "sliding contact surface" of Fig. 1, and similarly "scratches" 12 form peaks and valley-shaped recess portions according to Fig. 1 of Article A Number 3 and are equivalent to "annular discontinuous peaks" from the perspective that there are peaks; therefore, "a sliding bearing forming a plurality

of axially directed, annular discontinuous peaks which extend circumferentially on a sliding contact surface" is described in Article A Number 3.

Furthermore, the invention 1 of this case describes:

"A sliding bearing in which, an imaginary reference line is defined which intersects with each peak regions at a position at which, as viewed in an axial cross-section, the total cross-sectional area of all peak regions is equal to the total cross-sectional area of valley-shaped recess regions, and extends parallel to the axis, the top of the peak having a height ΔC above the imaginary reference line and a height as measured from the bottom of the valley-shaped recess to the top of the peak, denoted by h, the parameter ΔC being taken on a vertical axis and the parameter h being taken on the horizontal axis in a graphical representation, the parameters ΔC and h being located within an area defined by four rectilinear lines given by the following mathematical equations:

$h = \Delta C$ ... (1)

$h = 5 / 1.9 \Delta C$ ... (2)

$h = 8$ ... (3)

$\Delta C = 1$ ... (4).

where h and ΔC are measured in units of μm."

In contrast, a structure equivalent to the above description is not directly described in Article A Number 3; however, as described above, Article A Number 3 describes "the depth of scratches 12 can be approximately 0.003 mm-0.015 mm." Furthermore, the depth d of the scratches 12 is equivalent to the height h between the bottom of the valley-shaped recesses and the vertices of the peaks of the invention 1 of this case.

Additionally, according to the description in the Article A Number 3 stating "the bottoms of the scratches 12 have a round shape R and are uniformly aligned across a width L of bearing metals 4 and 5", it is recognized that Fig. 1 describes that the scratches 12 are processed as an arc with radius R, width l and depth d. Therefore, there is no reason for not having such a shape.

Furthermore, if ΔC (the definition which is the same as the invention related to claim 1) of the scratches 12 in Article A Number 3 is calculated for the case of $d = 5$ μm, $l = 0.2$ mm which is the same as $h = 5$ μm, $p = 0.2$ mm (p is the pitch between the peaks and is equivalent to the width l in Article A Number 3), 3.3350 μm is obtained (see Attached Sheet 1 filed by party seeking invalidity. There is no dispute between the parties concerning the calculation result and equations described in Attached Sheet 1).

Furthermore, this value is a value within the area defined by the rectilinear lines shown by four equations (1) - (4) as set forth in claim 1.

Therefore, the scratches 12 described in Article A Number 3 are included within a range established in the above-mentioned point. As a result, the above-mentioned point is described in Article A Number 3.

Therefore, all of the structural elements of the invention 1 of this case are described in Article A Number 3.

c. Concerning the Invention Described in Article A No. 4

Article A No. 4 describes "bearing surface: 1.5S (broach) - 3S (boring, plating)" as "surface finishing", so there is an indication as if the surface of the sliding bearing were accurately processed; however, nothing is described relating to any of the structure of the invention 1 of this case. Furthermore, it merely suggests that conventionally, only making the

surface of the sliding bearing as smooth as possible was emphasized, and there is no description or indication of any technical concept of arranging peaks.

Therefore, it is not recognized that Article A No. 4 describes the invention 1 of this case.

d. Concerning the invention described in Article A No. 7

According to the description of Article A No. 7 stating that "the degree of irregularity of the bearing surface is usually 5-10 μ[m], and 2-3 μ[m] for a high speed high pressure, and 1 μ[m] or less for super high speed", conventionally, only making the surface of the sliding bearing smooth is emphasized, and it merely indicates that arrangement of peaks and valley-shaped recess regions was not considered.

Therefore, it is not recognized that Article A No. 7 describes the invention 1 of this case.

e. Concerning the invention described in Article A No. 8

Article A No. 8 describes that the processed surface of a sliding bearing surface whose processed surface is partially approximated by a sine curve.

However, this is a mathematical model concerning a process characteristic of aero boring, and does not indicate that peaks and valley-shaped recess regions are aligned in the surface of the sliding bearing or that lubricating oil is held. It merely analyzes a surface shape which is not desired but is nevertheless generated.

Furthermore, if the processed surface is shown as a model, peaks with the same height which are regularly aligned can be drawn as shown in Fig. 2 of Article A No. 8; however, there is not sufficient evidence that a technical concept is shown in which peaks and valley-shaped recess regions are aligned in the surface of the sliding bearing and lubricating oil is held.

Thus, it is not recognized that Article A No. 8 describes the invention 1 of this case.

f. Concerning the invention described in Article A Nos. 12-16

As described in the above-mentioned "concerning [Article A Nos. 12-16]", these are all sliding bearings whose surfaces are designed to meet the demand of being accurately processed to a degree of ∇ ∇ ∇, and in which actually, the maximum height Rmax is approximately 4-7 μm and forms a complex waveform which seems as if the cross-sectional shape has periodicity.

Therefore, even if the surface of the sliding bearing is smoothly processed as much as possible, it is recognized that there is no description or indication of a technical concept such that peaks and valley-shaped recess regions are aligned in the surface of the sliding bearing and that lubricating oil is held.

Furthermore, the cross-sectional shape which can be seen in the test data is merely a complex waveform which can seem as if the shape of the peaks and valley-shaped recess regions had periodicity as described above. Therefore, even if the histogram (see the test data of Article A Nos. 12-16) is observed, no support can be found for the proposition that equations (1) - (4) related to the inventions 1 and 2 of this case are not satisfied, due to the presumed shape difference.

Therefore, if the sliding bearing of Article A Nos. 12-16 is compared with the sliding bearing related to the invention 1 of this case, they are common only on the point of being "a sliding bearing in which a plurality of continuous peaks are formed."

Thus, it is not recognized that Article A Nos. 12-16 factually demonstrate that the invention 1 of this case is described and that the invention 1 of this case was well known before filing of this patent application.

g. As described in the above-mentioned c-f, the invention 1 of this case is not the invention described in any of Article A Nos. 4, 7, 8 and 12-16, and Article A does not show that [the invention 1] is an invention which was well known before filing of the patent application.

However, as described in the above-mentioned b, the invention 1 of this case is described in Article A No. 3, and, under Japanese Patent Law, Section 29, Article 1, No. 3, patentability cannot be granted for the invention 1 of this case.

(2) Concerning the inventions 2 and 3 of this case

A. The party filing the opposition asserts that the invention 2 of this case is the invention described in Article A Nos. 3, 15, and 16, and that invention 3 of this case is the invention described in Article A No. 3.

Therefore, the inventions described in Article A are compared with the inventions 2 and 3 of this case, and a determination is made.

B. Inventions described in Article A

It is recognized that the following inventions are described in Article A Nos. 3, 15, and 16 submitted in the invalidity reason 1.

[Article A No. 3]

See the above [Invention described in Article A No. 3] of section II, 3, (1), B.

[Article A Nos. 15 and 16]

See the above [Invention related to Article A Nos. 12-16] of section IV, 2, (1), B.

C. Comparison and determination concerning the inventions 2 and 3 of this case

a. If the inventions 2 and 3 of this case are compared with the invention described in Article A No. 3, in the inventions 2 and 3 of this case, the range of ΔC and h is narrower than in equations (1) - (4) of the invention 1 of this case and restricted to equation (1) - (4) related to the invention 2 of this case, which is within a range covered by the equations (1) - (4) of the invention 1 or equation (1) - (3) of the invention 3. Therefore, they are not different.

Therefore, in the same manner as in the case of the invention 1 of this case, if ΔC (the definition is the same as in the invention related to claims 2 and 3) in Article A No. 3 is calculated for the case of $d = 5$ μm and $l = 0.2$ mm, which is the same as $h = 5$ μm and $p = 0.2$ mm (p is a pitch between peaks and equivalent to the width l in Article A No. 3) included in the inventions 2 and 3 of this case, the scratches 12 are 3.3350 μm and are included within the range established by equations (1) - (4) of the invention 2 of this case, or equations (1) - (3) of the invention 3 of this case.

Therefore, due to the same reason as the reason in the invention 1 of this case, all the structural elements of the inventions 2 and 3 of this case are described in Article A No. 3.

b. Furthermore, it is not recognized that the inventions 2 and 3 of this case are the inventions described in any of Article A Nos. 15-16, due to same reasons as described in the above-mentioned VI, 2, (1), C.

c. Therefore, as described in the above-mentioned a, Article A No. 3 describes the inventions 2 and 3 of this case, so, under the provisions of Japanese Patent Law, Section 29, Article 1, No. 3, patentability of the inventions 2 and 3 of this case cannot be granted.

3. Determination concerning the invalidity reason 2

(1) Concerning the inventions 2 and 3 of this case

A. The party filing the opposition asserts that a person of ordinary skill in the art could easily invent the invention 2 of this case based on the prior art invention as described in Article A Nos. 2, 6, and 10 and the invention described in Article A No. 7, and that a person of ordinary skill in the art could easily invent the invention 3 of this case based on the prior art invention as described in Article A Nos. 2, 6, and 10 and the invention described in Article A Nos. 12-16 or Article A No. 7.

B. The inventions described in Article A

It is recognized that the following inventions are described in Article A Nos. 7, 2, 6, 10 and 12-16 submitted for the invalidity reason 2.

[Article A No. 7]

See the above [Article A No. 7] in section VI, 2, (1), B.

[Article A No. 2] (Japanese Patent Publication 63-11530)

In claim 1 of the scope of the claims, "a moving liquid pressure sliding bearing in which a support surface 3 supporting a movable part has groove-shaped concave portions 6 distributed over a width of the support surface, the [groove-shaped] concave portions 6 are inclined at a maximum angle of 20° (α) with respect to a moving direction 5 of the movable portion, a lubricating agent path 7 which assures formation of a minimum moving liquid pressure along with the movable portion 4, and an axial line direction interval (a) which is measured between the center of a groove-shaped concave portion 6 and the center of an adjacent groove-shaped concave portion 6 is smaller than or equal to an upper value of

$$a0 = 200 + 0.5d + 0.006d2$$

which is given in μm, using a bearing diameter d measured by mm until reaching a maximum value of 10 mm."

is described, and Figs. 1-6 describe a cross-sectional shape of a moving liquid pressure slide bearing specified by the above-mentioned description.

[Article A No. 6] (Japan Mechanical Study Lecture Thesis, "Lubrication of a Sliding Surface with Regular Concavities and Convexities", pages 77-80, 1967)

According to Figs. 3-5 of page 78, a study of lubrication characteristics is described in which 3μ-25μ concavities are radially arranged in a direction along a diameter direction in a side

surface of a rotatable disk (upper end of the test disk of Fig. 3), and lubricating oil is supplied. It also describes that 1-3 times the minimum oil film thickness is good for the depth of the concavities.

[Article A No. 10] ("ENGINEERING BULLETIN NO. 11-62, BORED BEARING SURFACE", page 1, Clevite Corporation, published by Cleveland Graphite Bronze Division, November 16, 1962).

The translation of Article A No. 10 describes that "a boring process was conventionally used for the processing of a bearing surface; however, in the field of automobiles, broach processing is used for the benefit of the processing speed. However, some clients demand a boring process for matching of tool marks of a bearing surface and a rotational shaft, and for maintaining an oil holding function."

[Article A Nos. 12-16]

See the above [the invention related to Article A Nos. 12-16] in section VI, 2, (1), B.

C. Comparison and Determination

a. Concerning the invention 2 of this Case

The description of Article A No. 7 that "the irregularity degree of the bearing surface is usually 5-10 μ, 2-3 μ for a high speed high pressure, and 1 μ or less at super high speed" is described in "d. Shaft Hardness and Surface Roughness." Therefore, it is only understood that "the irregularity degree of the bearing surface" means the surface roughness which is specified in JIS B0601 (see Article A No. 11, which will be described later).

Thus, it is recognized that the description of the Article A No. 7 merely means that the surface of the sliding bearing is made smooth conventionally and indicates that the arrangement of peaks and valley-shaped recess regions is not considered. Furthermore, it does not indicate or

describe the technical concept of "a plurality of annular continuous or discontinuous peaks which extend in a circumferential direction of a sliding contact surface are formed in an axial direction" of the invention 2 of this case.

Furthermore, the invention of Article A No. 2 has a point which is common to the invention 2 of this case, that is, grooves which can save lubricating oil (groove-shaped concave portions 6) are arranged in the bearing surface. However, the bearing surface has a flat support surface 3. As a result, the groove-shaped concave portions 6 do not satisfy the condition of equations (1) - (4) of the invention 2 of this case.

Furthermore, the overall width of the sliding surface at which the bearing surface and the rotational shaft contact (the axial direction length contacting the rotational shaft of the sliding surface is all added to the axial direction) becomes large, so it is recognized that frictional loss is larger than the invention 2 of this case.

Article A No. 6 describes lubrication when 1.3 μ - 25 μ concave portions are radially arranged in a direction along a diameter direction on the top of a rotatable disk (upper end of the test disk of Fig. 3) and lubricating oil is supplied. However, even if this can be applied to a bearing (thrust bearing) receiving a load in a direction which is the same as the axial direction of the rotational shaft, it does not form annular peaks which extend in a circumferential direction. The end portions of the grooves are opened, and lubricating oil cannot be held (as is clear from Fig. 5 of Article A No. 6, a device which constantly supplies lubricating oil is needed). Therefore, it is not recognized that this can be applied to the surface shape of the sliding bearing.

When the description of Article A No. 10 is considered, in general, tool marks are unavoidably generated in either a broach process or boring process, and it is clear that one of ordinary skill in the art desires that the tool marks of the rotating shaft (finishing processing is

usually performed by a lathing/cutting process, and the tool marks are in a circumferential direction) and the tool marks of the bearing surface are matched as seen from a perspective of a function of holding lubricating oil and reducing the friction due to sliding of the rotational shaft surface and the bearing surface.

Therefore, the description of Article A No. 10 of "a boring process is required for matching the tool marks of the bearing surface and the rotational shaft and for maintaining the oil holding function" merely means matching of the direction of the tool marks, and does not mean that peaks and valley-shaped recess regions are arranged in the surface of the sliding bearing. Thus, the invention 2 of this case is not indicated thereby.

Thus, it cannot be recognized that one of ordinary skill in the art could easily invent the invention 2 of this case based on the invention described in Article A No. 7, which does not describe or indicate any technical concept of "a plurality of annular continuous or discontinuous peaks which extend in a circumferential direction of the sliding contact surface are formed in an axial direction," and the well known invention Article A Nos. 2, 6, and 10, which does not describe or indicate any technical concept of "a plurality of annular continuous or discontinuous peaks which extend in a circumferential direction of the sliding contact surface are formed in an axial direction."

b. Concerning the invention 3 of this case

As stated in the consideration concerning the invention described in Article A No. 7 in the above-mentioned "VI, 3, (1), C, a, Concerning the invention 2 of this case", Article A No. 7 does not describe or indicate any technical concept of "a plurality of annular continuous or discontinuous peaks which extend in a circumferential direction of the sliding contact surface are formed in an axial direction."

Furthermore, each invention related to Article A Nos. 12-16 merely indicates sliding bearings whose surfaces are designed to meet the demand of being accurately processed to a degree indicated by ∇ ∇ ∇, and actually, the maximum height Rmax is approximately 4-7 μm and forms a complex waveform which seems as if the cross-sectional shape had periodicity. Even if the surface of the sliding bearing is smoothly processed, it can be only interpreted that [any invention related to Article A Nos. 12-16] does not describe or indicate any technical concept of holding lubricating oil by arranging peaks and valley-shaped recess regions in the surface of the sliding bearing. The cross-sectional shape seen in the test data is merely a complex waveform which seems as if the shape of the peaks and valley-shaped recess regions had periodicity; therefore even if the histogram (see the test data of Articles A Nos. 12-16) is observed, no support can be found for the proposition that, from the presumed shape difference, the equations (1) - (3) related to the invention 3 of this case are satisfied.

Additionally, as described in the above-mentioned "VI, 3, (1), C, a, Concerning the invention 2 of this case", the invention described in Article A No. 2 has a point in common to the invention 3 of this case because the groove-shaped recess portions 6 which can hold lubricating oil are arranged in the bearing surface. However, the bearing surface has a flat support surface 3, and as a result, the groove-shaped recess portions 6 do not satisfy the conditions of equations (1) - (3) of the invention 3 of this case, and the overall width of the sliding surface at which the bearing surface and the rotational shaft contact becomes a value which in which the width of the support surface 3 is added. Therefore, it is recognized that frictional loss is larger than that in the invention 3 of this case.

In addition, Article A No. 6 describes lubrication when lubricating oil is supplied by radially arranging 1.3 μ - 25 μ recess portions in a direction along a diameter direction on the top

of a rotatable disk (top end of the test disk of Fig. 3). However, even if this can be applied to a thrust bearing receiving a load in a direction which is the same as the direction of the rotational shaft, annular peaks which extend in a circumferential direction are not formed. Therefore, there is no sufficient evidence that this can be applied to the surface shape of the sliding bearing.

Furthermore, the description of "a boring process is demanded for matching the tool marks of the bearing surface and the rotational shaft and for maintaining the oil holding function" of Article A No. 10 merely means that the directions of the tool marks are matched, and does not mean that the peaks and the valley-shaped recess regions are arranged in the surface of the sliding bearing.

Thus, it is not recognized that one of ordinary skill in the art could easily invent the invention 3 of this case based on the invention described in Article A No. 7 or the inventions described in Article A Nos. 12-16, which do not describe or indicate any technical concept of "a plurality of annular continuous or discontinuous peaks which extend in a circumferential direction of the sliding contact surface are formed in an axial direction," or on the inventions described in Article A Nos. 2, 6, and 10, which do not describe or indicate any technical concept of "a plurality of annular continuous or discontinuous peaks which extend in a circumferential direction of the sliding contact surface are formed in an axial direction", and which do not satisfy the conditions of equations (1) - (3) related to the invention 3 of this case.

Comparison and determination were also performed for Article A Nos. 1, 5, 9, and 11 submitted by the party filing the opposition in order to explain the technical background of the sliding bearing.

[The inventions described in Article A Nos. 1, 5, 9, and 11]

[Article A No. 1] (Japanese Patent Publication 43-9198)

Claim 1 of the scope of the claims describes "an improved boring plate which bores a half cylindrical bearing having a vertical axis line parallel to a divided surface which does not change a parallel interval between a moving direction of a boring rod and a vertical axis line of the half cylindrical bearing, and arranges an automatic contact between a motor device and the boring rod on which first and second cutters are mounted in order to compensate slight irregularity between the axis line of the boring bar and the axis line of the motor."

[Article A No. 5] ("Precision Work Method", page 121, published by Kyoritsu Publishing Corporation, 1969)

"3.3 Finished Surface Roughness and Accuracy" on page 121 describes "... roughness of the finished surface which is obtained by precision boring is... normally within a range of 2 to 10μm, but when the best finishing is performed, it increases to a degree which can be seen in Table 3.4 . . . In particular, it can be seen that it has reached a degree where polishing is not even needed in soft metal." Furthermore, the finished surface roughness of aluminum alloy is described as 0.4μ in Table 3.4.

[Article A No. 9] ("Current Design Trends of Sleeve Bearing and Thrust Washers in Passage Car Automatic Transmission", page 17, published by SOCIETY OF AUTOMOTIVE ENGINEERS, 1968)

There is no translation for Article A No. 9; however, according to the assertion by the party filing the opposition, continuous peaks are described in which the distance between the peaks and the valley-shaped recess regions is approximately 200μ inches (5μm) in the measured surface shape of a bearing bushing.

[Article A No. 11] (JIS "DEFINITION AND DISPLAY OF SURFACE ROUGHNESS JIS B 0601", published by Japanese Industrial Standard Association, March 1990)

JIS B 0601 described in Article A No. 11 describes a rule concerning the definition and display of surface roughness of an industrial product.

[Comparison and determination of the invention of this case and the inventions described in Article A Nos., 1, 5, 9, and 11]

a. Comparison between this case and Article A No. 1

The invention described in Article A No. 1 merely indicates a precision processing method in which a bearing surface is boring-processed by a boring plate, and does not indicate anything related to the structure of the inventions 1, 2, and 3 of this case.

Furthermore, the party filing the opposition asserts that when the boring process is performed, processing damage which is called "tool marks" is unavoidably generated in the processed surface and that, as a result, the continuous peaks of the inventions 1, 2, and 3 of this case are merely tool marks.

However, a tool mark is unavoidably generated even when [the surface] is processed as smoothly as possible. Meanwhile, with respect to the continuous peaks of the inventions 1, 2, and 3 of this case, from the perspective of the technical concept, as is clear from the description of [Operation] of section [0005] of the patent specification that

> [a]ccording to the sliding bearing in this type of structure, by holding lubricating oil in the spacing (valley-shaped recess portions) within annular grooves which are formed at a position where the peaks are adjacent to each other, the amount of lubricating oil which is maintained in the sliding contact surface can be increased. Furthermore, even if the internal diameter dimension of the sliding contact surface

of the sliding bearing is set to be small so that the spacing between the peaks of the sliding contact surface of the sliding bearing side and the sliding contact surface of the rotating shaft side can be made small, the actual spacing between the rotating shaft and the sliding bearing is larger than the case of the conventional sliding bearing, frictional resistance between the sliding contact surfaces can be made small,

peaks and the valley-shape recess regions which can hold lubricating oil are formed. From the perspective of the technical concept, this is different from tool marks which are unavoidably generated.

b. Comparison with Article A No. 5

Article A No. 5 describes that the surface of the sliding bearing needs to be precisely processed, but does not describe anything related to the structure of the inventions 1, 2, and 3 of this case.

Rather, if the description of "it is understood that it is improved to a degree where polishing is not needed, particularly in soft metal" and the fact that, generally, one of the objects of polishing is to smooth a processed surface are considered, conventionally, only making the surface of the sliding bearing smooth is emphasized. This indicates that alignment of the peaks and the valley-shaped recess regions was not considered.

c. Comparison with Article A No. 9

According to the assertion of the party filing the opposition, continuous peaks are described in which the distance between the peaks and the valley-shaped recess regions is approximately 200μ inches (5μm) in the measured surface shape of a bearing bushing. However, as is clear from Fig. 32, it merely describes the measurement value of a so-called tool

mark (processing damage), and does not describe or indicate any technical concept of the inventions 1, 2, and 3 of this case, which arranges the peaks and the valley-shaped recess regions in the surface of the sliding bearing and holds lubricating oil.

d. Comparison with Article A No. 11

Article A No. 11 is the Japanese Industrial Standard (JIS B 0601) which regulates "the definition and the display of surface roughness," and merely regulates the definition and display of surface roughness of an industrial product as described in the title.

Furthermore, the surface roughness of the industrial product described in Article A No. 11 is not directly related to any technical concept such that peaks and valley-shape recess region are arranged in the surface of sliding bearing of the inventions 1, 2, and 3 of this case to hold lubricating oil.

When the inventions 1, 2, and 3 of this case are implemented, if there is no high-precision processing technology (processing technology which can reduce the surface roughness defined by the above-mentioned JIS B 0601), peaks and valley-shaped recess regions cannot be distinguished from surface roughness because the peak height is several μm, and there will be no meaning. However, this does not mean that the inventions 1, 2, and 3 of this case are not established with the technical concept. This merely establishes the difference between the existence of surface roughness or processing damage and the structure on the bearing surface related to the inventions 1, 2, and 3 of this case.

Therefore, Article A No. 11 is not recognized as providing any description related to the inventions 1, 2 and 3 of this case.

e. Combination of the inventions described in Article A Nos. 1, 5, 9, and 11

Article A Nos. 1, 5, 9, and 11 do not describe that annular peaks which extend in a circumferential direction are arranged in a bearing surface, as recited in the inventions 1, 2, and 3 of this case as described above. Even if these are combined with any other invention, there is no reason to find that the inventions 1, 2, and 3 of this case could have been easily invented.

Furthermore, by applying the inventions described in Article A Nos. 1, 5, 9, and 11 to the invention described in each number of Article A (excluding Article A No. 3), there is no reason to find that the inventions 1, 2, and 3 of this case could have been easily invented.

VIII. Conclusion

As described above, the inventions 1, 2, and 3 of this case are the invention described in Article A No. 3, which is a publication distributed before the filing of this patent application. Therefore, the patent related to the inventions 1, 2 and 3 of this case violates the provisions of Japanese Patent Law Section 29 Article 1 No. 3, and, under the provisions of Section 123 Article 1 No. 2, should be invalidated.

With the respect to expenses of the trial decision, according to the rule of Civil Suit Law Section 61 which is used under Japanese Patent Law Section 169 Article 2, the patentee should bear the burden of expenses incurred.

It is so ordered.

February 21, 2001

Hiroshi SATO, Japanese Patent Office Chief Judge

Susumu FUNAKI, Japanese Patent Office Judge

Yuji WADA, Japanese Patent Office Judge

[Trial decision classification] P1112.113-ZB (F16C)

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This certifies that the above-mentioned matters are the same as the matters recorded in the file.

Certified date: February 21, 2001
Masanobu INAMI, Trial Decision Clerk Sealed